Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal

Section 1. General administrative information

Enhance Fish, Riparian, And Wildlife Habitat Within The Red River Watershed

Bonneville project number, if an ongoing project 9303501

Business name of agency, institution or organization requesting funding
Idaho County Soil and Water Conservation District

Business acronym (if appropriate) ISWCD

Proposal contact person or principal investigator:

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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name
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Pocket Water, Inc.	8560 Atwater Drive	Boise, ID 83714	Mr. Steve Bauer
LRK Communications	228 SW McKenzie	Pullman, WA 99163	Ms. Linda Klein
University of Idaho, College of Engineering	800 Park Blvd., Suite 200	Boise, ID 83712	Dr. Peter Goodwin
Idaho Department of Fish and Game (responsible for long-term O & M	Clearwater Region 1540 Warner Ave.	Lewiston, ID 83501	Mr. Jim White Mr. Calvin Groen

NPPC Program Measure Number(s) which this project addresses.

**4.1 (Salmon and Steelhead Goal: Double Salmon and Steelhead Runs Without Loss of Biological Diveristy), 7.6 (Habitat Goal, Policies, and Objectives), 7.7 (Cooperative Habitat Protection and Improvement with Private Land Owners).

NMFS Biological Opinion Number(s) which this project addresses.
**n/a - project does not relate directly to these programs; however, project is a habitat enhancement project for anandromous and resident fish species, specifically, spring Chinook salmon, steelhead trout, and bulltrout.

Other planning document references.
**This watershed project is consistent with the goals of the 1) Wy-Kan-Ush-Me Wa-KushWit; 2) Nez Perce National Forest Plan (1987); 3) Nez Perce Tribal Hatchery Plan (1992); 4) Idaho Department of Fish and Game's Anadromous Fish Management Plan, Resident Fish Management Plan, Elk Management Species Plan, and Nongame Species Plan; 5) ISWCD Five Year Plan; 6) Clearwater Focus Watershed; 7) Columbia Basin Fish and Wildlife Authority's (CBFWA) Integrated System Plan for Salmon and Steelhead Production in the Columbia River Basin (1991); 8) Clearwater River Subbasin: Salmon and Steelhead Production Plan (Nez Perce Tribe and Idaho Fish and Game, 1990); and 9) Interior Columbia Basin Ecosystem Management Project (1994). Letters of support for this project from USFS, IDFG, and Nez Perce Tribe are enclosed.

Subbasin.
**Clearwater Subbasin

Short description.
**Restore physical and biological processes to create a self-sustaining river/meadow ecosystem using a holistic approach and adaptive management principles to enhance fish, riparian, and wildlife habitat and water quality within the Red River watershed.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish	X	Construction	X	Watershed
+	Resident fish	+	O & M	+	Biodiversity/genetics
+	Wildlife		Production		Population dynamics
	Oceans/estuaries		Research	+	Ecosystems
	Climate	+	Monitoring/eval.		Flow/survival
+	Other		Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement	+	Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

** modeling, water quality, riparian plant communities, wetlands, education

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
	n/a - no other projects depend on this one for funding	n/a

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Restore natural river channel shape, meander pattern, and substrate conditions to enhance the diversity of spawning and rearing habitat for Chinook salmon, steelhead trout, and resident fish species	a	Re-evaluate watershed conditions and engineering design criteria using adaptive management principles
		b	Perform topographic survey of project site and future site within watershed
		c	Develop conceptual restoration design
		d	Review design with Technical Advisory Committee (TAC) and project sponsor
		e	Complete the detailed engineering design and specifications
		f	Develop permit application package
		g	Survey and stake project site
		h	Set up field office
		i	Deliver materials and equipment and create access roads
		j	Install restoration design features
		k	Establish final grade and prepare for revegetation
2	Restore meadow and riparian	a	Re-evaluate revegetation design

	plant communities to enhance fish and wildlife habitat and stablize streambanks		criteria using adapative management principles
		b	Develop conceptual revegetation design
		c	Review design with Technical Advisor Committee and project sponsor
		d	Complete detailed revegetation specifications
		e	Collect native seed, on-site
		f	Grow container seedlings
		g	Collect and store willow cuttings
		h	Provide and install container seedlings and cuttings
		i	Prepare and plant disturbed construction areas with native grass seed mix
		j	Fertilize and irrigate
		k	Build wildlife exclosures and plant with native riparian trees and shrubs
3	Raise public awareness of watershed restoration principles and techniques	a	Re-evaluate public information plan with Technical Advisory Committee and project sponsor
		b	Continue public presentations of educational video and slide shows
		c	Maintain and update web site
		d	Publish journal articles, conference papers, and press releases
		e	Distribute informational brochures and update on-site public information signs
		f	Add to image library
		g	Maintain GIS database and produce maps
		h	Conduct field tours
		i	Continue local volunteer activities
		j	Provide outdoor classroom opportunities for students of all ages
		k	Update the river restoration model that assists future designs of this project and add information to the

			associated manual that transfers technology to other watershed projects
4	Measure success in satisfying long-term project goals, objectives, and outcomes	a	Re-evaluate success criteria using adaptive management principles
		b	Monitor construction turbidity and suspended sediment loads
		c	Measure plant survival rates
		d	Complete Technical Advisory Committee field reviews
		e	Evaluate stream channel response
		f	Measure change in water temperature regime
		g	Measure change in greenline and riparian vegetation composition
		h	Document photopoints for changes in channel stability and riparian vegetation
		i	Evaluate fish populations through snorkel and redd counts
		j	Map changes in fish habitat units
		k	Complete Habitat Evaluation Procedure (HEP)
		l	Measure changes in groundwater elevation
		m	Evaluate surface substrate composition
5	Manage and communicate project activities to efficiently accomplish project goals	a	Assist project sponsor with personnel contract preparation
		b	Develop project and personnel time schedules
		c	Assist project sponsor with permit application submittal
		d	Update and distribute communication plans
		e	Coordinate and facilitate Technical Advisory Committee meetings
		f	Coordinate project activities with project sponsor, landowner, Tribes, agencies, and consultants
		g	Share information with adjacent landowners and other public and

			private interests
		h	Provide on-site construction supervision, communications, and administrative support
		i	Prepare quarterly and annual reports

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	3/1999	2/2000	50.16%
2	3/1999	2/2000	16.69%
3	3/1999	2/2000	8.80%
4	3/1999	2/2000	12.49%
5	3/1999	2/2000	11.86%
			TOTAL 100.00%

Schedule constraints.
**Extreme weather causing saturated soils or high flow conditions, delay in approval of the 1999 design elements or permits, extreme natural event damaging previously constructed channel features, major equipment breakdown, injury/death of consultant(s)

Completion date.
2003

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel		$333,047
Fringe benefits		$116,566
Supplies, materials, non-expendable property		$76,300
Operations & maintenance		$25,500
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		$0
PIT tags	# of tags:	$0
Travel		$29,555
Indirect costs		$8,992
Subcontracts		$0

Other		$0
TOTAL		$589,960

Outyear costs

Outyear costs	**FY2000**	**FY01**	**FY02**	**FY03**
Total budget	$580,000	$570,000	$560,000	$550,000
O&M as % of total	7.00%	5.00%	5.00%	4.00%

Section 6. Abstract

The Red River has been channelized and the riparian habitat corridor eliminated. The river responded by incision resulting in steepened banks, increased sedimentation, degraded fish habitat, elevated water temperatures, depressed groundwater levels, and significantly reduced hydroperiods. The ongoing Lower Red River Meadow Restoration Project is an on-the-ground ecosystem enhancement effort that restores natural physical and biological processes to establish a sustainable diversity of habitats consistent with the 1994 Columbia Basin Fish and Wildlife Program. February 1998 will conclude the fifth year of our ten-year restoration/enhancement plan. Construction of the first two phases (over one mile of river) is complete. Plantings accelerate the native plant colonization, provide diverse habitat features, and increase channel stabilization. State-of-the-science hydrologic and geomorphic models are used to design future phases, provide decision support for adaptive management, and develop interpretative displays. Comprehensive monitoring of physical and ecological parameters is used to determine whether the success criteria have been achieved. Linkages and benefits between the local restoration site and watershed are quantified. The educational and outreach components of the project include interpretive signage, integration of students in monitoring or research activities, a manual of restoration lessons learned in the watershed, and scientific publications. A web-site describing the project, including real-time site conditions and imaging, is maintained and updated regularly. Monitoring is expected to continue beyond the project time frame for education and research.

Section 7. Project description

a. Technical and/or scientific background.

The headwaters of the Red River form in North Central Idaho about four miles northwest of Green Mountain. The river flows west about 28 miles where it joins the American River to become the South Fork of the Clearwater River. The 1999 project location is in the lower Red River meadow (Sec.19, T.28N. - R.9E.) on the Idaho Department of Fish and Game's (IDFG) Red River Wildlife Management Area (RRWMA).

On a watershed scale, changes in land-use practices have altered the hydrology, sediment delivery, and water quality characteristics of Red River. Construction of reservoirs and

hydroelectric dams in the higher-order river systems downstream (Snake and Columbia) has inhibited the migration of anadromous fish species. On a local scale, the river channel has been straightened and riparian vegetation eliminated either in an attempt to maximize the grazing area throughout the meadow or due to hydraulic mining. The channelization of Red River has resulted in several detrimental effects to the ecology of Red River. First, the river has less diversity of instream habitat (pools, riffles, overhanging banks, woody debris). Second, the channel bed has degraded (or downcut) by approximately two feet. Downcutting of the channel bed has been accompanied by a lowering of the groundwater table. As the channel bed is scoured down, the meadow floodplain is inundated less frequently. Changes in groundwater depth and surface-water hydroperiod have resulted in a drying of the Red River meadow and thus, hydrologic conditions are unable to sustain the native riparian and wetland plant communities once thriving there (Brunsfeld et al., 1996). Third, channelization has reduced the length of river channel, thus increasing the erosive power through the meadow. This problem has been compounded by the increased height of the banks as the river has downcut. The process of incision is likely to continue until checked by bedrock or some other geologic or geomorphic control. Finally, the removal of riparian vegetation and the altered geomorphic characteristics of the river (greater water surface width and shallow depths at low flows) have resulted in elevated water temperatures during the summer months. The decline of both resident and anadromous fish populations in the Red River has been proportional to the rate of habitat and water quality degradation [Bonneville Power Administration (BPA), 1996].

The Lower Red River Meadow Restoration Project is an ongoing, "on-the-ground" watershed project, and therefore, committed to long-term habitat improvements that are crucial for restoring natural anadromous fisheries production capability in the Clearwater River subbasin. The restoration philosophy of the project is consistent with the normative ecosystem concept [National Research Council (NRC), 1996; Independent Scientific Group (ISG), 1996]. The design criteria chosen for habitat improvements are based on restoration of the physical processes of the natural river system that will result in sustainable channel characteristics and native riparian plant community. Specifically, the design objectives include restoration of the river meandering form, the hydroperiod in the meadow, the relationship between the groundwater table and the meadow, and the sediment transport regime. Over the past two field seasons the project has restored over one mile of stream channel. This restoration included reconnecting historic channel meanders, constructing new meanders, installing rock grade control structures, and planting native riparian and wetland vegetation. The project has already documented an improvement in the amount of spawning and rearing habitats due to restoration activities in 1996 [Pocket Water, Inc. (PWI), 1997, unpublished monitoring data]. Funding in 1999 and out-years will make it possible to add to these habitat improvements on the RRWMA and private land parcels upstream and downstream.

All previous and proposed work is designed to meet the need for off-site mitigation consistent with the goals and objectives of the Northwest Power Planning Council's (NPPC) 1994 Fish and Wildlife Program (FWP) specifically, "doubling salmon and steelhead runs in Columbia Basin without loss of biological diversity" (4.1), "habitat goals, policies, and objectives" (7.6), and "cooperative habitat protection and improvement with private landowners" (7.7) (NPPC, 1994). Relationships of this project to other region projects and programs are discussed in detail in Sections 7c and 8.

b. Proposal objectives.

The overall project goal is to restore the diverse physical and biological features of the Red River meadow ecosystem to provide high quality habitat for Chinook salmon (*Oncorhynchus tshawytscha*), steelhead trout (*Oncorhynchus mykiss*), bull trout (*Salvelinlus confluentis*), and other anadromous and resident fish species [Idaho County Soil and Water Conservation District (ISWCD), 1995]. To accomplish this goal, the project has set forth the following objectives:

Objective 1. Restore natural river channel shape, meander pattern, and substrate conditions to enhance the diversity of spawning and rearing habitat for Chinook salmon, steelhead trout, and resident fish species: The restoration design emphasizes an understanding of the natural physical processes at work in the Red River and allows these processes to move the system toward a dynamic geomorphic equilibrium. The restoration work results in a minimum maintenance condition since the native vegetation and river ecosystem will be self-sustaining and able to adjust to natural perturbations, such as flooding, sediment scour, and deposition.

Objective 2. Restore meadow and riparian plant communities to enhance fish and wildlife habitat and stabilize streambanks: Restoring native plant communities previously removed or repressed from the Red River meadow plays a key role in improving associated riparian habitats. Fish habitats and water temperature benefit from shade provided by shrubs and trees. Under-cut bank habitat and streambank stability increases with root establishment of hydrophytic plant communities. Erosion-resistant root systems decrease bank sloughing, thereby reducing turbidity and improving water quality. Habitat for most bird and mammal species associated with the meadow will improve as density and height of woody shrubs increase.

Objective 3. Raise public awareness of watershed restoration principles and techniques: Recognizing the importance of local involvement and public awareness to maintaining healthy watersheds, we will continue to provide site tours, distribute informational brochures, present educational videos and slide shows, publish journal articles, write press releases, and maintain the web site during 1999 and out-years. The University of Idaho (UI) has joined the project to provide technical assistance for many of these activities. The RRWMA will be used as an outdoor laboratory, where people can observe (in a controlled and minimum intrusive manner) the life of anadromous fish in the headwaters of the Columbia Basin, the importance of wise management of watersheds, and the science of restoration.

Objective 4. Measure success in satisfying long-term project goals, objectives, and outcomes: One of the primary criticisms of restoration projects during the past two decades has been the inability to define success. We have developed a series of metrics to measure the ecological value of this project. The monitoring program is used to apply adaptive management principles and to develop guidelines for monitoring similar projects in the region. Through collaboration with the UI, the monitoring of physical and ecological parameters is expected to continue beyond the project time frame for education and research purposes.

Objective 5. Manage and communicate project activities to efficiently accomplish project goals: The intensity, scope, and complexity of this project requires input and support from numerous governmental agencies and public and private interests. The high degree of involvement of these various groups necessitates effective communications and management to ensure project goals and objectives are accomplished in a timely and cost-effective manner. Management and communications personnel will assist the ISWCD in all phases of the project from planning to implementation. Documents relating to the project including Technical Advisory Committee (TAC) meeting minutes, quarterly reports, feedback loop reports, and annual reports are available to all interested parties.

c. Rationale and significance to Regional Programs.

During the past decade, there has been increasing recognition that quick, local engineering or biological "fixes" for a degraded ecosystem, which neglect the larger scale physical processes, are often of little long-term value (Dister et al., 1990; Falconer and Goodwin, 1994; Havno and Goodwin, 1995; NRC, 1996; Barinaga, 1996; Napa River Community Coalition (NRCC), 1996). The most important element in restoration planning is to restore the natural physical processes at the site (Barinaga, 1996). Furthermore, hydrologic conditions in the lower Red River meadow prevent re-establishment of the native riparian plant communities based on re-planting alone (Brusnfeld et al., 1996). Based on this philisophy and existing meadow conditions, the ISWCD, TAC, and the project consulting team have chosen a "soft engineering" approach that restores the physical and biological processes to the river system (with minimal bank and channel stabilization measures), allowing the ecosystem to evolve toward and maintain a state of natural, dynamic equilibrium.

Accomplishing the project's objectives will restore overhead and instream cover; provide a source for nutrients and woody debris; increase the quantity of pool, run, and riffle sequences; stabilize streambanks; increase channel length and sinuousity ratio; raise the groundwater table; lower water temperatures; decrease erosion and sedimentation; and increase the quality of spawning gravels. Consistent with the goals of the FWP (1994), these features will improve the quality of fish habitat, increasing the survival of juvenile and adult salmon and steelhead and allowing more offspring to migrate to the ocean. In addition, the amount of wetland area in the meadow will increase due to a rise in water table elevation and re-establishment of natural floodplain function. These conditions will result in the enhancement of the quality and diversity of resting, cover, and breeding habitat for waterfowl and other wildlife.

Pursant to the FWP's (1994) goals relating to private landowner cooperation and public outreach/education, the project's Phase V will initiate restoration work on private properties adjacent to the RRWMA. This work will provide another opportunity for cooperative habitat protection and improvement. An extensive educational and public outreach program is underway to increase public awareness of watershed science and restoration principles. A goal of this project is to become a model for other watershed restoration projects in Idaho so that others can benefit from lessons learned. The RRWMA has the capacity to become a center for workshops and an outdoor classroom for students of all ages.

This ongoing project remains consistent with or complements the goals and objectives of other Federal, state and Tribal resource plans and ongoing restoration work including: 1) Nez Perce National Forest Plan (1987); 2) Salmon and Steelhead Production Plan (Nez Perce Tribe and IDFG, 1990); 3) Nez Perce Tribal Hatchery Plan (1992); 4) IDFG's Anadromous Fish Management Plan, Resident Fish Management Plan, Elk Management Species Plan, and Nongame Species Plan; 5) ISWCD Five Year Plan; 6) Clearwater Focus Watershed; 7) Columbia Basin Fish and Wildlife Authority's (CBFWA) Integrated System Plan for Salmon and Steelhead Production in the Columbia River Basin (1991); and 8) the Interior Columbia Basin Ecosystem Management Project [US Forest Service (USFS) and Bureau Land Management (BLM)]. Additional cooperative relationships are described in Section 8.

d. Project history

The Red River is recognized as a major spring Chinook and steelhead production stream (Nez Perce Tribe and IDFG, 1990) and Red River's upper and lower meadows were identified early on in the FWP as high priority for habitat enhancement (NPPC, 1987). The Lower Red River

Meadow Restoration Project encompasses four properties and 4.4 miles of stream channel. The project will have completed its fifth year at the end of February 1998, including three years of planning and two years of implementation. By February 28, 1998 the project will have cost $1,215,478. Reports related to the project include (see reference list for details): 1) PWI, 1994a; 2) PWI, 1994b; 3) River Masters Engineering (RME), 1994; 4) ISWCD, 1995; 5) Brunsfeld et al., 1996; 6) BPA, 1996; 7) PWI, 1997; 8) 1st-4th Quarter Reports, 1996; 9) 1st-3rd Quarter Reports, 1997; and (10) PWI et al., 1997.

1993:

BPA, IDFG, Trout Unlimited, Rocky Mountain Elk Foundation, National Fish and Wildlife Foundation, Nez Perce Tribe, and U.S. Forest Service (USFS) purchased one of the four properties in the lower Red River meadow. This property, formerly the Little Ponderosa Ranch (320 acres), was deeded over to IDFG to manage for fish and wildlife benefits as the RRWMA.

1994:

PWI and River Masters Engineering (RME), consultants to the ISWCD, completed an overall design strategy and budget for stream restoration using the FY1993 funds. The consultants utilized a habitat stream survey, channel morphology survey, and analysis of historical conditions to develop a natural stream restoration approach.

1995:

Project planning and design for the RRWMA area were completed with the assistance of the Technical Advisory Committee (TAC), representing a broad range of agencies and public interest groups. An environmental assessment (BPA, 1996), a cultural resources survey (Luttrell, 1995), and an analysis of options at Red River (Brunsfeld et al., 1996) were completed during this period. Restoration of the 1.5 miles of stream on the RRWMA was divided into four phases with the intent of completing one phase/year, beginning on the upstream end of the property (Phase I) and finishing on the downstream end (Phase IV). Phases V - VIII will move restoration work to willing landowners upstream and downstream of the RRWMA.

1996:

Phase I project implementation restored 3,200 feet of stream channel including 780 feet of historic channel and 1,270 feet of new channel. Techniques that were tested this year included use of water bladders to divert stream flow, rock sill construction for grade control, log habitat structures, reuse of historic meander bends, reinforced stream banks to divert water into new or historic channels, and jute matting and grass seeding for erosion control. Monitoring turbidity during construction provided an evaluation of best management practices (BMPs) used to mitigate the release of suspended sediment.

1997:

Phase II project implementation reconnected approximately 1,560 feet of historic channel and constructed 780 feet of new channel. Based on lessons learned in 1996, different methods were used for channel diversion, water disposal, and timing of construction activities. Revegetation was a major effort this year with plant installation throughout Phase I and II. Woody plants included 5,714 willow (*Salix spp.*) cuttings, 3,244 river alder (*Alnus incana*) seedlings, and 1,000 red osier dogwood (*Cornus stolonifera*) seedlings. Herbaceous seedlings included 21,337 sedge (*Carex spp.*), rush (*Juncus spp.*), and bulrush (*Scirpus spp.*). Eight wildlife exclosures were built in the Phase I construction area and planted with native riparian plants to monitor browsing impacts on growth and survival rates of new plantings. A comprehensive monitoring program was initiated this year to evaluate changes to stream channels, fish and wildlife habitat, and water quality as described below in Section 7(e). Monitoring results will be incorporated into the 1997 Annual Report. Preliminary monitoring data has shown that the site is meeting or evolving toward satisfying the success criteria. The one exception has been controlling turbidity at brief but critical periods of the construction process. This is a common problem encountered in this type of restoration project and is sometimes handled by releasing the turbid water at times of the

year when the water is naturally turbid. The environmental impacts of this increase in turbidity can then be proven negligible. Unfortunately, this is not a viable option in the Red River due to the very short construction time window and is unlikely to be an option in many rivers in Idaho. We are now studying experiences from other regions and will continue to modify our turbidity mitigation techniques to improve this situation. From lessons at Red River, we can develop successful BMPs that may be transferred to similar local and regional restoration projects.

e. Methods.

Scope: In accomplishing the goal related to Chinook salmon and steelhead, we recognize that it is necessary to take a more holistic approach by targeting restoration of the riparian meadow ecosystem and accounting for linkages within the watershed. Therefore, additional benefits accrue to riparian-dependent species and upland wildlife habitat. The stated objectives reflect the holistic view of restoring a riparian ecosystem for multiple fish and wildlife benefits and enhancing water quality. In 1999, the project will a) assess the performance of the previous constructed phases of the project; b) adjust the design criteria and methodology using monitoring data results, adaptive management principles, and guidance from agencies and the TAC; c) prepare the design for and begin implementation of Phase IV; and d) continue with the public outreach/education plan implementation, watershed data collection and analyses, and topographic survey and planning for work on the adjacent upstream property (Phase V). The ISWCD and project team plan to use the Lower Red River Meadow Restoration Project as a local and regional demonstration project for other stream restoration and watershed projects.

Approach: The most important element in restoration planning is to restore the natural physical processes at the site. It is the physical processes that will enable a river or wetland to evolve toward a sustainable dynamic equilibrium to which the habitat and ecology are adjusted. In order to understand these physical processes and the implications of various management actions, it is important to evaluate the local site and its linkage to the watershed. Restoring these natural physical processes will create conditions for the re-establishment of the native riparian plant community and the expansion of wetland areas in the meadow floodplain. Riparian vegetation will improve fish habitat by restoring instream and overhead cover, enabling the development of undercut banks, and providing nutrients and instream woody debris. Deep and dense root systems will increase bank stability and reduce erosion thereby improving water quality. The project's comprehensive monitoring plan evaluates the performance of design features and enables the use of adaptive management principles. Monitoring results, restoration success, and lessons learned will be transferred to others through an extensive public outreach/education program.

Critical Assumptions:

1) The consecutive-phase implementation structure of the restoration design, based on a holistic watershed/ecosystem approach, is by necessity a multi-year endeavor. The process of degradation in the non-restored reaches is likely to continue until checked by natural geologic or geomorphic controls. The potential, therefore, exists for the development of a physical or associated habitat discontinuity at the most downstream grade control structure of the restored area. Continuation of the project will ensure that on-the-ground improvements completed to date do not "unravel" in the long-term.
2) The establishment and survival of the native wet meadow/riparian plant communities is dependent on the restoration of the hydrologic conditions necessary to sustain them.

3) Restoring natural river function and processes will result in a long-term trend toward habitat recovery with minimal need for further human intervention.

4) Restoring historic river channel morphology, geometry, and riparian vegetation will result in high quality and diverse instream habitat for spring Chinook salmon, steelhead trout, bulltrout, and other anadromous and resident fish species.

Detailed Methodology (lower case letters correspond to tasks listed in Section 4):

Objective 1. Restore natural river channel shape, meander pattern, and substrate conditions to enhance the diversity of spawning and rearing habitat for Chinook salmon, steelhead trout, and resident fish species:

(a) Linkages between the local site and the watershed will be used in several different ways. During the design period, the variability in sediment loading and changes in upstream hydrology will be assessed and included in the design criteria. This information will enable the range of possible responses of the river reaches in the meadow to be evaluated. Following implementation of the project, changes in channel geometry, sediment size and quantity, and water quality will be used to assess the relative importance of upstream hydrologic and geomorphologic events through the RRWMA. In addition, the monitoring data will enable the relative benefits of local restoration projects to be quantified at the watershed scale. For example, if the restoration project reduces the water temperature in summer months by a certain increment, we could determine the benefits to the entire watershed if this restoration strategy was extended through all the meadows in the watershed. These kinds of statistics will be useful in scoping other similar projects and demonstrating their potential value in the future. Specifically, this work will include analysis of aerial photographs and hydrologic analysis at the watershed scale to determine the role of different processes.

(b) Detailed topographic surveys will be undertaken using GPS and ground survey techniques through the restoration area and at reference sites. This survey will also include the expansion of long-term monitoring cross-sections and habitat features. A combination of ground survey and aerial photography will be used to accurately map the planform of the river and future changes.

(c) Recent research has shown the importance of selecting an appropriate model for restoration/management activities (Willetts and Hardwick, 1993; Ackers, 1993; Interagency Floodplain Management Review Committee, 1994; Havno and Goodwin, 1995). In order to develop conceptual restoration design, the UI will apply a meander migration model (based on formulations by Parker, 1984; Larsen, 1995) and a hydrodynamic model (Falconer et al., 1989; Danish Hydraulic Institute, 1996) to simulate water quality, sediment transport and hydroperiod throughout the meadow reaches of the Red River. In addition, analytical tools for the geomorphic characteristics of the channel (for example, Leopold et al., 1995) and surface water-groundwater interactions will be used. The 1999 design will expand the current design criteria through information gathered in the adaptive management monitoring and experiences gained from other watershed restoration projects, for example the Napa River (NRCC, 1996). A detailed conceptual design will be then completed that provides a natural channel alignment, including features to raise the water levels in the incised channel, increase channel length and sinuosity ratio, and biostabilize highly erodable streambank areas.

(d) During the past three years the TAC, ISWCD, and project consulting team have developed a close working relationship. This close collaborative effort will continue throughout each critical stage of the design.

(e) Due to the narrow construction window in any given year, engineering specification and construction documents will be prepared well ahead of time. To minimize any on-site difficulties and ensure the project is constructed in the least disruptive and cost-effective manner, the design and construction documents will be reviewed by the construction contractor prior to permit

submittal. Any necessary changes will be made under the direction of the engineer with input from the TAC, ISWCD, and project consulting team.

(f) All in-channel work (below the high water mark) proposed by the project requires two permits: 1) Nationwide Permit 4 (per Section 404 of the U.S. Clean Water Act) issued by the U.S. Army Corps of Engineers (USACE) and 2) Stream Alteration Permit (per Section 42-3805) of the Idaho State Code) issued by the Idaho Department of Water Resources (IDWR). The permit application package is prepared and submitted 6 weeks prior to construction start date to allow sufficient time for review, coordination, and approval among affected agencies. Permit applications include all design plans and specifications, wetland delineation and mitigation plans, and suspended sediment mitigation plans.

(g-j) Upon permit approval, the project site (Phase IV) will be surveyed and staked, the field office will be set up, and materials and equipment will be delivered. Access roads will be created and perimeter fence constructed. Channel features will be installed in accordance to the 1999 engineering specification and construction documents and conditions of the permits. Maintenance agreements will be secured with landowners to ensure future protection of habitat improvements.

(k) Construction areas will be final graded and prepared for revegetation.

<u>Objective 2.</u> Restore meadow and riparian plant communities to enhance fish and wildlife habitat and stabilize streambanks:

(a) The revegetation design criteria for this project were established after studying historical records and photographs and identifying local plant communities and soil characteristics (Brunsfeld et al., 1996). Using adaptive management principles, recent published data, and the project's 1997 and 1998 revegetation monitoring data, the revegetation design criteria and critical assumptions will be evaluated and modified as necessary.

(b-c) Early in 1999, a written and illustrated conceptual revegetation design will be developed and reviewed with the TAC and project sponsor.

(d) Upon approval, the detailed revegetation drawings, including plant and material specifications will be completed and incorporated into the engineered drawing package.

(e-f) Native seed from various woody and herbaceous plants will be collected on-site during the 1998 field season and cleaned and stored at Wildlife Habitat Institute (WHI) in Princeton, ID. In the early spring of 1999, the seed will be stratified and then sown on media in trays for greenhouse propagation of container seedlings.

(g) During the winter of 1999, WHI will collect and trim willow cuttings in preparation for the 1999 field season. The cuttings are stored, in the dormant stage, by sealing them in plastic bags and placing them in a dark nursery cooler until time for planting in the late spring.

(h) Delivery and planting of dormant cuttings can begin as early as June 15th depending on weather conditions. Container woody and herbaceous seedlings can be delivered and planted throughout the field season (June 15th – August 31st). However, early summer plantings are preferred to ensure sufficient root growth, plant development, and higher survival rates. Planting locations and densities are guided by the detailed revegetation specifications, based on the soil erosion potential of various stream reaches and hydrologic requirements of particular species. During the construction process (July 1st-August 15th), WHI will provide expertise and advise regarding soils placement, plant/water relationships, planting schedule, traffic control near planted areas, and final grading.

(i) After construction is completed in Phase IV, disturbed areas will be prepared and planted with a native grass seed mix. Erosion control matting will be installed in vulnerable areas to minimize the impacts of erosive processes.

(j) All newly planted vegetation is fertilized and irrigated as necessary. Seed will be collected in the 1999 field season for planting in year 2000.
(k) Six additional wildlife exclosures (similar to those constructed in Phase I and II) will be constructed in Phase III and planted with woody vegetation to continue the project's efforts in evaluating browsing impacts on plant growth and survival rates. Exclosures planned for Phase IV will be constructed in year 2000.

Objective 3. Raise public awareness of watershed restoration principles and techniques:
(a) Implementation of the public information plan will proceed, continuing to reach a broad range of age groups and various public and private sectors through a variety of educational materials. The IDFG is interested in developing the project site for educational purposes. Over the past few years, IDFG obtained funds to produce the RRWMA Education Management Plan (1995, unpublished report), purchase interpretive signs, and build a Watchable Wildlife viewing platform.
(b) Plans in 1998 include providing an opportunity for a college student to work with a professional on producing a video documentary. In 1999, this educational video can be used for on-site tours or other public outreach opportunities. In addition, slide shows will be presented to a variety of audiences.
(c) An interactive web site, used as a public information and educational resource, will be updated regularly and maintained in cooperation with UI.
(d-f) Journal articles, conference papers, and press releases will be published; informational brochures will be distributed; and on-site information signs and the image library will be updated.
(g) The UI will also help update and maintain the GIS database (to be initiated in 1998). This database will be used to demonstrate long-term changes in the meadow ecosystem due to restoration activities. Selected images will be posted onto the project web-site.
(h) A public outreach campaign will continue to involve volunteers from the local community in restoration activities. Slide presentations will be made at local schools and community group functions. Students of all ages will be encouraged to participate in various monitoring activities and long-term science projects. These educational opportunities are designed to provide hands-on experiences with ecological restoration techniques and principles.
(i) Site-tours will be given during the field season.
(j) The RRWMA has the facilities to host student tours and field exercises to provide opportunities to learn about fish and wildlife, watershed management, and restoration principles and techniques. The UI is collaborating with the project to jointly monitor project outcomes using undergraduate and graduate level classes. Plans for graduate level research are being developed.
(k) This project is a concentrated effort at stream restoration, which will be used as demonstration site and model for other projects. Model results used for the design process will be used as an interpretative exhibit on-site, featuring animation in an easily understandable graphic presentation. The development of a manual of restoration guidelines (initiated in 1998) will continue so that we can document and transfer technical information related to design approach, adaptive management, monitoring, ecological benefits, and lessons learned.

Objective 4. Measure success in meeting long-term project goals, objectives, and outcomes:
(a) Restoration work must often be implemented without complete scientific knowledge of outcomes. Therefore, an extensive monitoring program has been implemented to assess the performance of the project. This site-specific information is used to guide future management decisions thereby optimizing ecologic, geomorphic, and hydrologic conditions in the long-term.

The initial list of success criteria developed prior to project implementation is reviewed annually for adequacy. All monitoring data will be integrated into an ArcInfo GIS. Monitoring tasks are summarized below and described in detail, with references, in the *Lower Red River Meadow Restoration Project: 1997 Monitoring Plan* (PWI, 1997).

(b) In order to measure compliance with the Idaho Water Quality Standards [Idaho Division of Environmental Quality (DEQ), 1996], turbidity is measured continuously during the construction phase of the project. Three automatic, continuous turbidity sensors are located within the meadow that record turbidity (ntus) every 10 minutes. Manual samples are collected to estimate suspended sediment concentration (mg/L) and project load (tons).

(c) Planting success is measured by percent survival of individual species within one year of installation. These data will be integrated into the GIS to analyze variable survival rates between different plant species and planting locations. This information is used to guide future species selection, revegetation design, and planting methods.

(d) TAC field reviews are performed during and after construction to obtain a visual, qualitative assessment of current construction activities and previous implementation features.

(e) Total Station or GPS survey equipment will be used to survey channel features and reference sites, allowing the evolution of the geomorphic channel characteristics to be monitored pre-implementation, post- implementation, and over time. Data collected through the project site will be assembled into a hydraulic geometry database.

(f) Water temperature data will be collected continuously from mid-June to mid-September using waterproof data loggers. This monitoring data will allow the improvements in water temperature to be documented as a function of changes in the hydraulic geometry, interaction with groundwater, and vegetative cover.

(g) The extent and quality of the restored riparian plant community, compared to the potential natural community, will be measured using greenline and riparian community composition transect methodology (USFS, 1992; Cagney, 1993; BLM, 1993).

(h) Photopoints will be used to document visual changes in channel stability and riparian vegetation. This photographic record will also be a component of the project manual being prepared as a restoration guidebook.

(i) Fish populations are evaluated annually by the IDFG through snorkel and redd counts. The UI will assist in installing and maintaining an underwater camera to track fish species' utilization of pool habitats.

(j) Detailed maps of specific geomorphic features (microhabitats or fish habitat units) created or enhanced by project design implementation will be surveyed and included in the GIS.

(k) Via a cooperative arrangement with IDFG, a Habitat Evaluation Procedure (HEP) will be completed annually to measure changes in habitat quality for specific wildlife species.

(l) Long-term groundwater monitoring stations will be installed to measure the recovery of the groundwater table following the restoration implementation.

(m) Sediment samples will be collected and analyzed to evaluate changes in surface substrate composition to document improvements for fish habitat. Samples will include Wolman pebble counts (Wolman, 1954) and particle size analyses of disturbed samples. For the purpose of the computer models, samples will be taken in the surface layer and 10cm beneath the surface.

<u>Objective 5.</u> Manage and communicate project activities to efficiently accomplish project goals and objectives:

(a-d) Project communications and management personnel will assist the ISWCD with personnel contract preparation, project and personnel time schedules, permit application submittal, and communication plans.

(e) Communications personnel will organize, facilitate, and prepare minutes of the TAC meetings. TAC recommendations on project design and implementation need to be conveyed accurately so that the project sponsor can make informed decisions. An efficient decision-making process is crucial for the timing of permit application requirements that must precede the field season.

(f-h) The communications and management personnel are on-site during the implementation phase to provide construction supervision, transfer of information to all involved parties, and administrative support. Effective coordination of field season activities will ensure all work is completed within the narrow window (July 1st - August 15th) imposed by regulations that protect fish and wildlife habitat and water quality. Furthermore, field season activities are coordinated in such a manner to minimize impacts to other land uses within the watershed. The DEQ is kept informed at all times of water quality status during project implementation.

(i) Project activity reports are prepared each quarter and a formal annual report is published. All reports are submitted to the BPA and ISWCD and copies are made available to all interested parties.

f. Facilities and equipment.

Office space and communication equipment:

During planning meetings with the TAC or between the sponsor and participating consultants, office space is generally provided, at no cost, by one of the participants. Laptop and personal computer equipment and supplies required for these meetings, as well as presentation equipment such as slide and overhead projectors, are typically provided by the participants at no cost to the project. We lease a 200 square foot, portable field office during the field season (mid-June through mid-September) that is set up in a central, but non-intrusive location on site. Telephone and electrical service is hooked up and office equipment (computer, printer, fax, telephone, answering machine) and furniture are leased. Portable radios facilitate communication between personnel at work in the meadow and personnel in the field office.

Education equipment:

The specialized equipment and services required to produce slide shows, brochures, educational videos, and update informational signs and the image library will be provided by agents specific to the task (e.g. photo shop, printing services, sign company). The project outreach plan that combines monitoring and education includes linking a remote, underwater camera and an on-site surveillance camera to an Internet web site and visitor center. School students of all ages will be encouraged to assist monitoring fish passage, pool habitat, and site conditions. Cameras, transmitters, and miscellaneous computer hardware for project outreach will require operation and maintenance during 1999. Separate grants will be targeted for application to share funding for these educational endeavors.

Field and construction equipment:

Restoring stream meander and channel geometry within the narrow construction window will require two track excavators with 1.5-2 yard buckets, a D8 bulldozer, a D4 finish bulldozer with rippers, and miscellaneous support equipment and supplies (fuel, tool truck, etc.). A six-inch water pump with intake and supply lines and powered by a gas or diesel motor will be needed for dewatering constructed or existing channels. This equipment will be specified and supplied through a construction contract. Irrigation equipment including five, two-inch water pumps, 58 sections of two-inch irrigation line, and assorted tools have been purchased by the project. This equipment is available on-site to supply water to newly planted seeds, seedlings, and cuttings. Four-wheel ATVs have proved an effective means to deliver personnel, equipment, and supplies to the project site. A four-wheel ATV has been leased in the previous field seasons. Lease or

purchase arrangements will be considered for a four-wheel ATV in the 1999 season. Tillage, planting, and fertilizing equipment will be supplied by the revegetation contractor. Fencing equipment and tools such as post drivers, stretchers, wire reels, and other hand tools will be supplied by the fencing contractor.

Technical and monitoring equipment:

Survey equipment such as total stations, transits, rods, global positioning systems, computer aided design software, and other computer hardware and software will be provided by the engineer consultant/contractor as part of their contract for services unless otherwise specified by the contract. UI will provide the project with computer facilities in the UI Eco-Hydraulics Laboratory with access software to be used in the design and data processing. Some of this software costs over $15,000 but will be used in the project design as an in-kind donation. Turbidity sensors, data loggers, flow meters, cameras, computers, and other water quality and monitoring equipment have been supplied by PWI in the past and we expect this to continue. The project will coordinate with the USFS to obtain watershed data supplied by the Red River Ranger Station hydraulic monitoring station.

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Section 8. Relationships to other projects

Related Projects:
Red River drainage is part of the coordinated restoration program of the Clearwater Subbasin Focus Watershed (sponsored by the Idaho State Soil Conservation Commission and the Nez Perce Tribe, Project #9608600), one of the 31 subbasins in the Columbia River Basin. Meadow Creek is a related and complementary restoration project in the South Fork Clearwater drainage (sponsored by the USFS, Project #9607700). Another restoration project, funded by BPA, is being initiated in the Macomas Meadows of the Nez Perce National Forest. A representative of that project has already been a guest at a Red River TAC meeting to gain insight and knowledge about undertaking a restoration project of this type.

The Lower Red River Meadow Stream Restoration project is part of the Lower Red River prescription watershed called for in the Nez Perce National Forest Plan (1987). This project collaborates with and compliments the numerous habitat improvement projects completed, in progress, or planned for other reaches of the Red River watershed and all other prescription watersheds within the Nez Perce National Forest that supply the South Fork of the Clearwater drainage. Since 1984, the BPA and Nez Perce Forest have focused restoration activities on critical habitats in these prescription watersheds using bank stabilization, fencing, and vegetative planting (Baer et al., 1990; Siddall 1992). The USFS upper Red River Meadow Stream Restoration project (Mullins property) provided an example of restoration techniques for this project and a wildlife fencing exclosure project at the downstream end of the lower meadow provided examples of native, woody and herbaceous riparian vegetation once abundant throughout the lower meadow.

The Red River Hatchery, a spring Chinook rearing facility, at the confluence of the Main Red River and the South Fork Red River receives funding from the "Lower Snake River Compensation". This hatchery assists the restoration of the anadromous fish runs via supplementation techniques for the Crooked River, Red River, and the South Fork of the Clearwater drainages.

Agency Cooperation and Support:
The Technical Advisory Committee (TAC) for the Lower Red River Meadow Restoration Project meets regularly throughout the year to review designs and plans and advise the ISWCD in the decision-making process. Members of the TAC include representatives from diverse backgrounds, providing a wide range of expertise and support including:

1) **Nez Perce Tribe:** watershed management, tribal fisheries, cultural expertise
2) **Idaho Fish and Game:** landowner; fisheries and wildlife expertise
3) **Idaho Division of Environmental Quality:** water quality expertise
4) **Nez Perce National Forest:** local cooperating agency; hydrology expertise
5) **Clearwater Focus Watershed:** coordination support; administers watershed goals
6) **Idaho State Soil Conservation Commission:** state support; advises and supports ISCWD
7) **Bonneville Power Administration (BPA):** represents funding agency interests
8) **Idaho County Soil and Water Conservation District (ISWCD):** project sponsor; local community support; private landowner liaison (will aid in securing cooperative, long-term agreements for stream restoration work with willing private landowners within the watershed)
9) **Natural Resources Conservation Service (NRCS):** federal and local community support; communications support with local private landowner

Collaboration with Other Organizations and Scientists:
The Eco-hydraulics Research Group (ERG) at the UI is actively seeking grants that would add a research element to this ongoing implementation project. These grants are to improve teaching at grade schools and universities, to refine existing hydrologic models of the interaction between floodplains and rivers, and to expand models integrating hydrologic, geomorphic and ecologic response. Collaborative funds secured to date include:

1) University of Idaho Seed Grant 1997-98: **$6,000**
2) In-kind Support (Faculty Salary, associated Fringe Benefits and Indirect Costs) During academic year, one-month support of EcoHydraulics Research Group Faculty (Drs. Goodwin and Jankowski): **$9,700**

3) Use of computer software and facilities: Software programs are valued in excess of $25,000

Total: $15,700 plus use of specialist computers and software

Permits:

All in-channel work (below the high water mark) proposed by the project requires two permits: 1) Nationwide Permit 4 (per Section 404 of the U.S. Clean Water Act) issued by the U.S. Army Corps of Engineers (USACE) and 2) Stream Alteration Permit (per Section 42-3805) of the Idaho State Code) issued by the Idaho Department of Water Resources (IDWR). Permit applications must be submitted 6 weeks prior to construction start date to allow sufficient time for review, coordination, and approval among affected agencies. Permit applications include all design plans and specifications, wetland delineation and mitigation plans, and suspended sediment mitigation plans. Permits must be located on-site and permit conditions adhered to at all times during the construction period. Should a request for modification of permit conditions become necessary during the construction period, the project must stop all work related to the request until clear direction is given from the USACE or IDWR. Representatives from the USACE and the IDWR have attended TAC meetings to advise the project concerning policy and regulations.

DEQ water quality standards must be upheld during the construction phase of the project according to the BMPs, detailed mitigation plans, and conditions set forth in the permits. Turbidity is monitored constantly throughout the construction phase to ensure compliance with water quality standards. BMPs are followed, evaluated, and adjusted when necessary to comply with water quality standards. A feedback loop with DEQ is in place in the event of a short-term water quality violation (> 50 ntus above background in one 24 hour period or > 25 ntus for 10 consecutive days) due to construction practices.

Section 9. Key personnel

Denny Dawes, President
Wildlife Habitat Institute

Project Responsibilities: Management (0.25 FTE)
Revegetation (0.25 FTE)

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Education:

1997 B.S. degree candidate, Wildlife Resources, University of Idaho, Moscow
June 1998 pending completion of 100-level class. Emphasis: Communication and Habitat Management

Relevant Work Experience:

1992 – present **President**, Wildlife Habitat Institute, Princeton, ID.
Involved in all aspects of the business.

1991-1993 **Greenhouse Assistant**, University of Idaho Forestry Research Nursery, Moscow, ID. *Assisted with many phases of nursery management including greenhouse construction, seed storage and stratification, media preparation, fertilization, irrigation, and cold storage.*

1982-1991 **General Manager**, Hash Tree Company, Princeton, ID.
Managed/worked all departments including administration, landscaping, production, and sales.

1974-1977 **Heavy Equipment Operator/Foreman,** Anchorage, AK.
Worked for several construction projects for various contractors, including Alaska pipeline work for Morrison-Knudson-Rivers.

Relevant Background:

Mr. Dawes has taught numerous seminars and classes on bird and mammal identification; wildlife, forest, and wetland habitat management; cost share programs; and habitat landscaping. Mr. Dawes has provided revegetation expertise to the Lower Red River Meadow Restoration project since 1995, including the planning and implementation of all phases of the revegetation objectives and tasks. As project manager, Mr. Dawes is responsible for managing and coordinating all project activities including personnel contracts and schedules, permit application procedures, design development, communications, engineering, construction, and monitoring. Mr. Dawes is currently president-elect of the Idaho Nursery Association.

Relevant Publications:

Pocket Water, Inc., River Masters Engineering, KLP Consulting, and Wildlife Habitat Institute. 1997. Lower Red River Meadow Restoration Project FY 1997 Work Statement. Prepared for Bonneville Power Administration and Idaho County Soil and Water Conservation District.

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Linda R. Klein, President
LRK Communications

Project Responsibilities: Communications (0.25 FTE)
Education (0.25 FTE)

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Education:

1995	M.S. Soil Science, Washington State University, Pullman
1980	B.S. Radiography, Idaho State University, Pocatello

Relevant Work Experience:

1997 – present	**President/Technical Communications Specialist**, LRK Communications, Pullman, WA. *Involved in all aspects of the business; provide technical writing/editing, communications coordination, meeting facilitation, and contract management services.*
1995-1997	**Stream Restoration Consultant/Communications Coordinator**, River Masters Engineering, Pullman, WA. *Responsible for many phases of stream restoration work including computer aided drawing, revegetation design/specification development, permit application, wetland delineation coordination, construction supervision, topographic survey, riparian/wetland plant survey/identification, seed collection, erosion control implementation, seeding/planting/fertilizing, irrigation, monitoring, and communications coordination.*
1995-1997	**Research Associate/Instructor,** Washington State University, Pullman, WA. *Performed research/literature reviews for the publication of a college-level, introductory soil science textbook and revised two chapters for a new edition of a college-level, natural resource management textbook; taught introductory soils, soil fertility, and soil seminar classes to undergraduate and graduate students.*

Relevant Background:

Ms. Klein has been involved in the Lower Red River Meadow Restoration Project since May 1996. She has had hands-on experience in nearly every aspect of the project. Communications responsibilities include disseminating project related information to all interested parties, relaying technical information between the TAC and the ISWCD, facilitating and documenting TAC meetings and field evaluations, writing/editing project reports, and implementing public outreach activities and production of educational materials.

Relevant Publications:

Klein, L.R. 1997. Lower Red River Meadow Restoration Project: 2nd quarter report, April-June 1997. Unpublished report submitted to BPA and ISWCD.

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Owen, O.S. and L.R. Klein. 1998. Aquatic environments. Chapter in *Natural Resource Conservation: Management for a sustainable future*. Authors: Owen, O.S., D.D. Chiras, and J.P. Reganold. Prentice Hall, Englewood Cliffs, N.J.

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Peter Goodwin, P.E.
University of Idaho

Project Responsibilities: Design/Engineering (0.25 FTE)
Monitoring Coordination (0.25 FTE)

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Education:

1986	Ph.D. Hydraulic Engineering, University of California, Berkeley
1982	M.S. Hydraulic Engineering, University of California, Berkeley
1978	B.Sc. Civil Engineering, University of Southampton, U.K.

Relevant Experience: Dr. Goodwin has been the PI, lead hydrologist, or project manager of several large scale river or watershed management studies including: 'Living River Strategy' for the Napa River Watershed (1991-present), Sediment Management Plan for the North Fork Feather River (1993-96), Russian River Enhancement Plan (1992-95), Floodplain Restoration of the Willamette River (1995-96), Tijuana River and Wetland Enhancement Plan (1995-present), Review of the Sedimentation issues of the Three Gorges Dam (1995), and San Lorenzo Flood Management Plan (1985-1996). These projects utilized adaptive management strategies. He is scientific advisor to several related projects including the San Dieguito Wetland Enhancement Project. Recent related research grants include projects funded by NATO, IBM, and NOAA.

Related Activities: Dr. Goodwin is Associate Editor of the ASCE Journal of Hydraulic Engineering with responsibility for computational hydraulics and restoration of rivers and wetlands. He is involved in several national and international activities closely related to this proposal, including the International Association of Hydraulic Research (IAHR) Ecohydraulics Committee and is chair of the American Society of Civil Engineers committee on wetland restoration. Dr. Goodwin is also the organizer or instructor on several short courses on environmental river and wetland management including the ASCE Continuing Education Course on Wetland Restoration (August 1997), the University of Idaho course on Environmental River Management (May 1997), and Geomorphology in River Restoration at the University of California, Berkeley.

Relevant Work Experience:

1996-present:	Associate Professor, Department of Civil Engineering, University of Idaho
1989-1996:	Technical Director, Philip Williams & Associates, Ltd., San Francisco.

Relevant Publications:

Havno, K. and P.Goodwin.1995. Hydraulic modeling of ecological criteria: Towards an integrated approach for hydrologic, geomorphic and ecologic understanding of river corridors. Seminar 2. XXVI IAHR Congress, London.

Jordan, J.J., J. Florsheim and P. Goodwin.1995. Using water resource and riparian parameters to develop a river management program in *Water Resources at Risk.* W.R. Hotchkiss, J.S. Downey, E.D. Gutentag and J.E. Moore. American Institute of Hydrology.

Falconer, R.A. and P. Goodwin. 1994. Wetland management. Thomas Telford, London.

Goodwin, P. and R.A. Denton. 1991. Seasonal influences on the sediment transport characteristics of the Sacramento River, California. Procs. of the Instn. of Civ. Eng., Part 2, 91.

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Education:

1975	M.S. Zoology, University of Idaho, Moscow (Emphasis: Aquatic Ecology)
1972	B.S. Biology, University of Missouri, Kansas City

Recent Work Experience:

1992 - present: Water Resource/Fisheries Consultant, Pocket Water, Inc. *Co-authored a water quality/habitat monitoring guide for evaluation of grazing impacts for the Environmental Protection Agency; completed the water quality module of two watershed assessments in Idaho; wrote a section of a Watershed Primer for EPA with the Oregon Water Resources Research Institute, conducted lake fisheries habitat evaluation for Idaho Power, and is continuing a long-term pollutant loading study in North Idaho using event-based continuous monitoring. Mr. Bauer currently provides technical expertise to EPA on fisheries habitat issues as an Aquatic Ecologist affiliated with the Idaho Water Resources Research Institute at the University of Idaho. As a member of a consulting group, Nonpoint Source Solutions, Mr. Bauer recently completed sections of a Watershed Assessment Manual for the Oregon Governor's Watershed Enhancement Board which will be used by Watershed Councils to guide stream restoration programs.*

1978 - 1992: Environmental Scientist, Idaho Department of Health and Welfare, Division of Environmental Quality. *Evaluated the impact of timber harvests, irrigation return flows, dryland runoff, and livestock grazing, led development of the Idaho Nonpoint Source Pollution Program to comply with the federal Clean Water Act, revised the Silvicultural and Agricultural Water Quality Pollution Abatement Programs, and worked with Idaho legislature and interest groups on water quality issues.*

Relevant Background:

Mr. Bauer performed, or assisted with, many of the preliminary site analyses in the lower Red River meadow and helped the ISWCD initiate the Red River project in 1994 as a project coordinator. He has assisted the ISWCD in completing the initial restoration design, in organizing a Technical Advisory Committee, and in completing the stream alteration permits and NEPA documents. In 1996 and 1997, he developed and implemented a project monitoring and evaluation program for the project.

Relevant Publications:

Nonpoint Source Solutions. 1997. Draft - Oregon watershed assessment manual. Prepared for the Oregon Governor's Watershed Enhancement Board. Portland, OR.

Karen Kuzis Consulting. 1997. Watershed analysis of the Upper East Fork South Fork of the Salmon River: Water Quality Section. Prepared for Krassel Ranger Station, Payette National Forest, McCall, ID.

Bauer, S.B. 1996. Gold Fork watershed assessment report: Water quality section. Prepared for Boise Cascade Corp. Boise, ID.

Bauer, S.B. 1994. Water quality status report: Jump Creek, Owyhee County, Idaho, 1992-1993. Prepared for Owyhee Soil Conservation District, Marsing, ID.

Bauer, S.B. 1993. Monitoring protocols to evaluate water quality effects of grazing management on western rangeland streams, EPA 910/R-93-017, U.S. EPA, Seattle, WA.

Section 10. Information/technology transfer

Elementary and Secondary School Students:
Linda Klein has a particular interest in school outreach and both ISWCD and the UI Eco-hydraulics Research Group (ERG) include educators of grade school students. Mr. Richard Jordan (Boise High School teacher) and Mr. Peter Lane (ISWCD Board Member and Grangeville Elementary School teacher) will work with the project team to structure project information into meaningful exercises for students from grade school to high school. These exercises will include site visits and projects that can be undertaken through data posted on the project web site. In particular, animated model simulations, remote sensing of data and video clips of the site will bring the restoration issues into the classroom. The feasibility of volunteer monitoring activities, performed by high school students, will be explored.

University Students:
In 1997, the Department of Civil Engineering at the UI brought the Introductory Survey Class to the Lower Red River Meadow Restoration site. These outdoor experiences will introduce engineers to the perspective of ecologists and natural resource managers very early in their careers. Restoration and enhancement projects are likely to form an increasing part of the activities of engineers in the coming decade and it is important for the students to see the value of an interdisciplinary approach. During a portion of this weekend field trip students were presented with an overview of the different aspects of the project and were able to observe fish counting and PIT tagging techniques. Two days were spent surveying and monitoring in the meadow.

Ms. Linda Klein (LRK Communications) and Dr. Peter Goodwin (UI) will develop educational components of the project appropriate for University students and the general public. Specifically, we will design monitoring, research, and science projects which can be extended throughout the academic year.

Continuing Education:
Dr. Goodwin has organized and lectured on numerous short courses for practicing engineers and scientists, including “Geomorphology in River Restoration”, “Physical Processes in Environmental River Management” and “Wetland Restoration”. The “Environmental River Management” course, organized by Dr. Goodwin and ERG, drew over 120 participants to Boise in May 1997. The Lower Red River Meadow Restoration Project was one of the case studies described in this short course. ERG plans to offer one short course per year on different aspects of river restoration.

Public Information:
Informational signs are displayed at two entrances to the RRWMA. These signs will be updated annually so that the local community and Nez Perce National Forest visitors can follow the progress of the project. An Interpretive Center/Watchable Wildlife viewing platform was constructed by the IDFG from funds donated by private foundations.

Interpretive signs will be displayed inside the viewing platform, illustrating the cycles of life within a wet meadow ecosystem, meadow ecosystem linkages to processes within the watershed, and principles of watershed management and river restoration.

During the field season, the field office displays artistic renditions of various phases and conceptual designs of the restoration project and is open to answer questions or provide tours to visitors and the local community. Organized tours will also be given to invited guests from various agencies and public and private groups.

A web-site will be updated and maintained by the UI. Information posted to the web-site will include current images from the underwater and surveillance cameras, model results, background information and monitoring data.

A computer at the RRWMA will display monitoring data collected by remote sensing and a simulation program will allow "what-if" scenarios to be explored by people with limited scientific understanding of the issues.

Research:
It is the intent of the Eco-hydraulics Research Group (ERG) at the UI to develop the Red River as a long-term field laboratory. Earlier restoration efforts in other areas of the watershed used different design and management philosophies. The Red River, therefore, provides a unique opportunity for a direct long-term comparison of the objectives of the different approaches, and the effectiveness of attaining these objectives. This comparative study will provide useful information to agencies responsible for restoration in the region.

The site will also provide a small-scale and easily monitored test area for models simulating geomorphic evolution, floodplain-river interactions, and linkages between ecology and physical processes being developed and used by ERG.

Scientific Publications/Dissemination:
The project consulting team and ERG will prepare both conference papers and peer reviewed journal articles. In particular, the project team will target the international “Eco-Hydraulics” conference in Salt Lake City in 1999. In addition, UI will maintain a database of design criteria and monitoring data. This 'living' database will be available to other scientists and engineers for research purposes or improving designs for future restoration projects. A companion manual will provide details of the design criteria, hydraulic geometry database, photopoint images, and design guidelines for similar projects.